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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/988,221	11/19/2001	Kazuhiro Hirohama	900-408	8213
23117 7590 01/16/2004				
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			EXAMINER	
			DEO, DUY VU NGUYEN	
			ART UNIT	PAPER NUMBER
			1765	

DATE MAILED: 01/16/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/988,221

Applicant(s)

HIROHAMA ET AL. 

Examiner

DuyVu n Deo

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 18 December 2003.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-15 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.  
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

## Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413) Paper No(s) \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

## DETAILED ACTION

### *Claim Rejections - 35 USC § 112*

1. Claims 1 and 9 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The limitation "etching gas which is of O<sub>2</sub>" and "etching gas of O<sub>2</sub>" are vague because they are neither opened or closed languages. It is suggested to use "consisting of" or "consisting essentially of" for exclusive limitation or "comprising" for inclusive limitation. At this time they are interpreted as inclusive limitation.

### *Claim Rejections - 35 USC § 102*

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1, 5, 9, 13 are rejected under 35 U.S.C. 102(e) as being anticipated by Ou-Yang et al. (US 6,379,574).

Ou-Yang describes a method for forming a semiconductor device comprising: a first step of depositing a first silicon oxynitride film and a second silicon oxide film, in this order, on an interconnection layer (or conductive layer) and etching a portion of the second silicon oxide film with a first fluorine-based etching gas until the first silicon oxynitride film is exposed; a second step of post-etch treatment to remove reaction product deposited on the first silicon oxynitride film with a second etching gas to expose the first film; a third step of etching the first silicon oxynitride film exposed through the second step with a third etching gas until the conductive layer is exposed; and a fourth step of a post-etch treatment to remove the reaction product deposited on the conductive layer through the third step with a fourth etching gas, thereby forming a via or concave portion penetrating the first and second films to reach the conductive layer surface (col. 6, line 12-40, line 56-60; col. 8, line 24-40; col. 9, line 24-30; figures 6-8).

Referring to claims 5, and 13, the post-etch treatment of the second and fourth step contain a plasma generated from a source containing oxygen (col. 7, line 32-34). This would also read on claimed etching gas, which is of O<sub>2</sub> or etching gas of O<sub>2</sub>.

#### ***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 2, 3, 6, 8, 10, 11, 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ou-Yang as applied to claim 1 above, and further in view of admitted prior art (pages 1-6 of specification).

Referring to claims 2 and 10, Ou-Yang is silent about the first, second, third, and fourth steps are successively carried out in a single apparatus. However, he teaches using an apparatus that can be used for dielectric etching process and the post-etch treatment. The post-etch treatment is preferably performed in the same chamber as the dielectric etch process (col. 6, line 41-61). Also as shown in the background in page 6 of the specification, it is well known to one skilled in the art that moving the wafer to different etching system or apparatus will expose the wafer to air causing the reaction product more difficult to remove. Therefore, it would have been obvious to one skilled in the art to perform all the steps within a single apparatus in order to reducing processing time and preventing wafer exposed to air (from moving the wafer back and forth from different apparatus). Referring to the limitation of maintaining in the apparatus a vacuum state. Ou-Yang describes the apparatus includes vacuum pumps which controls the etch chemistry in conformance with a particular process recipe (col. 5, line 55-58). It would have been obvious for one skilled in the art to maintain in the apparatus a vacuum state in order to controls the etch chemistry in conformance with a particular process recipe as taught by Ou-Yang.

Referring to claims 6, 8, and 14, Ou-Yang doesn't describe the conductive layer is a silicon substrate. However, he teaches forming contact hole for interconnection of various

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devices on the integrated circuit chip such as transistors and capacitors. The contact hole is formed to connect to the underlying substrate (col. 1, line 18-45). Pages 1 and 2 of the specification describes contact hole is formed for integrated circuit such as transistors and connect to underlying source/drain region of the substrate (claimed the conductive layer is a silicon substrate). It would have been obvious to one skilled in the art that the contact hole can be formed to connect to a conductive silicon substrate depending on the type of semiconductor device being manufactured in order to form transistor of a semiconductor device with a reasonable expectation of success.

Referring to claims 3 and 11, Ou-Yang describes etching the second silicon oxide film with a technique known in the art using a fluorine-based plasma. Page 4 of the specification teaches the prior art technique for etching the silicon oxide film with a fluorine-based gas such as C4F8. Therefore, it would have been obvious for one skilled in the art to use a fluorine-based gas such as C4F8 known in the art in order etch the silicon oxide film with a reasonable expectation of success.

6. Claims 7, 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ou-Yang as applied to claim 1 above, and further in view of Ko et al. (US 5,817,579).

Referring to claims 7 and 15, Ou-Yang describes the conductive layer is a layered substrate comprising polysilicon (col. 6, line 24-26). Polysilicon is known to form electrode of a field effect transistor as shown here by Ko (col. 7, line 13-16, line 35-36). Therefore, it would have been obvious to one skilled in the art that the conductive layer can be layered as an electrode in order to form a field effect transistor with a reasonable expectation of success.

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7. Claims 4 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ou-Yang as applied to claim 1 above, and further in view of Wang et al. (US 6,306,560).

Referring to claims 4 and 12, Ou-Yang doesn't describe type of gas such as CHF<sub>3</sub> or CH<sub>2</sub>F<sub>2</sub> for etching the first silicon oxynitride film. Wang describes a technique for etching silicon oxynitride film using an etching gas such as CHF<sub>3</sub> (col. 7, line 4-9). It would have been obvious for one skilled in the art in light of Wang using CH<sub>3</sub> gas in order to etch the silicon oxynitride with a reasonable expectation of success.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to DuyVu n Deo whose telephone number is 703-305-0515.

DVD

January 13, 2004

*YQ*